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Notes and Comments

Mandibular Ramus Flexure in an Indonesian Population

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Following the description of the flexure of the posterior margin of the mandibular ramus as a sexually dimorphic trait in Humans (Loth and Henneberg, 1996), we have studied cephalograms of living adult males and females in order to determine whether this trait is also sexually dimorphic in the Javanese population. Instead of visual assessment we have quantified the shape of the posterior margin of the mandible using Fourier analysis. We have found that the flexure, as described by Loth and Henneberg (1996), occurs almost exclusively in adult male mandibles, but it is not present in many females. When the flexure was observed in a female, it was shallower than in males and occurred not at the occlusal plane but close to the neck of the condyle. The discriminant function calculated on the harmonic amplitude values obtained from Fourier Analysis indicated 94% accuracy of determining the female sex and 90% accuracy of determining male sex in our material of 65 females and 70 males.

Using the same Fourier Analysis approach to cephalograms of 75 females and 75 males of the West Flores population, Mieke (1996) found 95% accuracy for females and 88% accuracy for males.

We propose that the sexually dimorphic mandibular flexure is caused by:

1. Contraction of the muscles of mastication which produce tension in the outer fibrous covering of the head which, in turn, subjects the skull and bones of the face to compression when teeth are brought into occlusion. In the mandible forces exerted by muscles of mastication are transmitted to the teeth through the cantilevered body of the mandible. This produces a bending force in the bone. This force is applied at the coronoid process and its line of action curves inferoanteriorly beneath the alveolar process (Thurow, 1970). Using finite element analysis it can be shown that this force causes the determination of the shape of the mandible (Fig. 1).

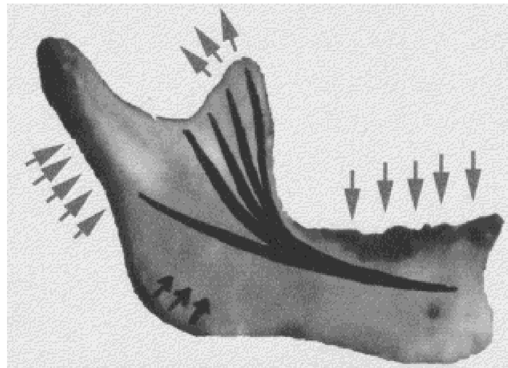

Fig. 1. Forces acting on mandible during mastication.

2. During growth and development of the mandible, the bone is formed at the head of the condyle thus causing the ramus to grow superoposteriorly while the bone is also deposited on the dorsal surface of the superior part of the ramus (Sperber, 1989) (Fig. 2).
3. During puberty, estrogen influences epiphyseal maturation and skeletal mineralization (Frank, 1995) thus stabilising the shape of a female mandible around 14 years of age while the increase continues for two more years in males. This makes the flexure of the posterior ramus more apparent.

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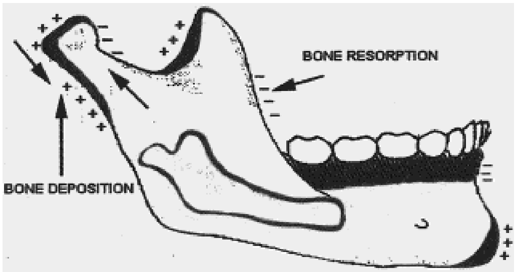

Fig. 2. Bone deposition and resorption during the growth of the mandible.

These differences in growth would explain why the flexure in males is at the occlusal level while in females, if present, it occurs close to the neck.

Differences in the shape of the mandible may occur between individuals and populations due to their dietary habits. Differences in the ramus shape have been found between people in the same population (West Flores population) eating soft and hard foods (Mieke, 1993). Since females in West Flores population tend to eat softer foods (Mieke, 1993) this may also be reflected in the shape of their ramus.

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